

CRITICAL PATH ROADMAP DISCIPLINE(S)	PRIMARY SPECIES / TYPE	GROUND EXPERIMENT TITLE	NASA OBPR - TASK BOOK								
			Year Experiment Was Listed in Book								
			1995	1996	1997	1998	1999	2000	2001	2002	
Cardiovascular Alterations	Animal	Adaptations of Visceral and Cerebral Resistance Arteries to Simulated Microgravity						1999	2000	2001	2002
Cardiovascular Alterations	Animal	Altered Gravity and Early Heart Development in Culture		1996	1997	1998					
Cardiovascular Alterations	Animal	Are G Proteins Mechanosensors for Endothelial Cells?	1995	1996	1997						
Cardiovascular Alterations; Muscle Alterations & Atrophy	Animal	Baroreflex Function in Rats after Simulated Microgravity		1996	1997	1998					
Cardiovascular Alterations	Animal	Blood Volume Regulation in Primates During Space Flight	1995	1996	1997	1998					
Cardiovascular Alterations; Muscle Alterations & Atrophy	Animal	Cardiac Atrophy				1998	1999	2000			
Cardiovascular Alterations	Animal	Cardiac Unloading: Biologic Mechanisms and Countermeasures for Cardiac Atrophy								2001	2002
Cardiovascular Alterations	Animal	Cardiac Valvuloseptal Morphogenesis			1997						
Cardiovascular Alterations	Animal	Cardiovascular Genomics in Gravitational Transitions									2002
Cardiovascular Alterations; Muscle Alterations & Atrophy	Animal	Cell & Molecular Biomechanics: Cardiac & Skeletal Muscle								2001	2002
Cardiovascular Alterations	Animal	Circulatory Remodeling with Simulated Microgravity								2001	2002
Cardiovascular Alterations; Immunology, Infection & Hematology	Animal	Effect of Microgravity on Vascular Cell Function	1995	1996	1997	1998					
Cardiovascular Alterations	Animal	Effect of Spaceflight on Adrenal Medullary Function				1998	1999	2000			
Cardiovascular Alterations	Animal	Experimental Neurogenic Hypertension Program: Supplement	1995	1996							
Cardiovascular Alterations	Animal	Mechanisms of Heterogeneity in the Lung			1997	1998	1999				
Cardiovascular Alterations	Animal	Mechanisms of Microgravity Effect on Vascular Function	1995	1996	1997	1998					
Cardiovascular Alterations	Animal	Mechanisms of Microgravity Effect on Vascular Function (This Task began in FY2000)					1999	2000	2001	2002	
Cardiovascular Alterations; Human Behavior & Performance	Animal	Microgravity and Circadian Cardiovascular Rhythms								2001	2002
Cardiovascular Alterations	Animal	Microvascular Alterations after Simulated Microgravity; Microvascular Alterations in Simulated Microgravity			1997	1998	1999	2000			
Cardiovascular Alterations; Muscle Alterations & Atrophy	Animal	Microvascular Changes During Microgravity	1995	1996							
Cardiovascular Alterations; Food & Nutrition	Animal	Neural Control Mechanisms and Body Fluid Homeostasis	1995	1996	1997	1998					
Cardiovascular Alterations; Clinical Capabilities	Animal	Physiological Effects of Decompression-Induced Venous Bubbles	1995	1996	1997	1998	1999				
Cardiovascular Alterations	Animal	Possible Countermeasures to Post-Suspension Hypotension in the Head-Down Tilt Rat Model								2001	2002
Cardiovascular Alterations	Animal	Respiratory Afferents and the Control of Breathing			1997	1998	1999				
Cardiovascular Alterations	Animal	Rodent Studies of Cardiovascular Deconditioning				1998	1999	2000			
Cardiovascular Alterations	Animal	Role of Adrenergic Receptors in Adaptation to Microgravity: Gene Targeted Mice as a Model of Microgravity Research					1999	2000	2001	2002	
Cardiovascular Alterations	Animal	Simulated Microgravity Impairs Vascular Contractility: Role of Second Messenger Signaling Pathways								2001	
Cardiovascular Alterations; Neurovestibular Adaptation	Animal	The Role of the Cerebellum in Cardiovascular Responses to Changes in Gravity					1999	2000			
Cardiovascular Alterations; Muscle Alterations & Atrophy	Animal	Vascular Control of Skeletal Muscle Blood Flow after Simulated Microgravity				1998					
Cardiovascular Alterations; Clinical Capabilities	Animal	Vascular Genomics in Gravitational Transitions								2001	
Cardiovascular Alterations; Neurovestibular Adaptation	Animal	Vestibular Influences on Different Outflow Limbs of the Sympathetic Nervous System						2000			
Cardiovascular Alterations; Neurovestibular Adaptation	Animal	Vestibular Influences on Sympathetic Outflows to Different Organs and Vascular Beds			1997	1998	1999				
Cardiovascular Alterations	Human	A Model for Down Regulation of Erythropoiesis in Space			1997	1998	1999				
Cardiovascular Alterations	Human	Adrenoreceptor Hypersensitivity in Models of Weightlessness	1995	1996	1997						
Cardiovascular Alterations	Human	Alterations in Cardiovascular Regulation and Function During Long-Term Simulated Microgravity				1998	1999				
Cardiovascular Alterations; Human Behavior & Performance	Human	Alterations in Cardiovascular Regulation and Function During Simulated Microgravity				1998	1999				
Cardiovascular Alterations	Human	Altered Brain Vasoregulation in Orthostatic Intolerance	1995	1996	1997	1998	1999				
Cardiovascular Alterations	Human	Assessment of the Effects of Chronic Microgravity on Ventricular Mass by Three-Dimensional Echocardiography	1995	1996	1997	1998					
Cardiovascular Alterations	Human	Autogenic Feedback Training as a Preventive Method for Orthostatic Intolerance	1995	1996	1997						
Cardiovascular Alterations	Human	Bed Rest and Neurovascular Function						2000	2001	2002	
Cardiovascular Alterations	Human	Blood Pressure - Determinants and Controllers			1997	1998					
Cardiovascular Alterations	Human	Capillary Fractal Perfusion Patterns May Protect the Lung during Microgravity								2001	2002
Cardiovascular Alterations	Human	Cardiopulmonary Hemodynamics in Microgravity	1995	1996	1997	1998	1999				
Cardiovascular Alterations	Human	Cardiovascular Effects of Simulated Microgravity in Man								2001	2002
Cardiovascular Alterations	Human	Carotid Baroreflex Function During Prolonged Exercise			1997	1998	1999				
Cardiovascular Alterations; Clinical Capabilities	Human	Characterization of Autonomic Function, Sodium Handling, and Nitric Oxide Physiology in Astronauts and Patients Known to be Susceptible to Orthostatic Intolerance (This Task began in FY2000)					1999	2000	2001	2002	
Cardiovascular Alterations	Human	Computer Simulation of Cardiovascular Function in Reduced Gravity			1997	1998					
Cardiovascular Alterations; Clinical Capabilities; Muscle Alterations & Atrophy	Human	Correlation Between Physiology and Shuttle Emergency Egress (1 year proposal)	1995								
Cardiovascular Alterations; Clinical Capabilities; Muscle Alterations & Atrophy	Human	Design and Validation of a Dynamic Exercise Countermeasure Device								2001	2002
Cardiovascular Alterations; Clinical Capabilities	Human	Diagnostic Three Dimensional Ultrasonography: Development of Novel Compression, Segmentation and Registration Techniques for Manned Space Flight Applications								2001	2002
Cardiovascular Alterations; Clinical Capabilities	Human	Digital Echocardiography in Manned Space Flight: Remote Diagnosis and Quantitative Analysis			1997	1998	1999	2000			
Cardiovascular Alterations	Human	Distributed Simulation of Integrated Human Function								2001	2002
Cardiovascular Alterations; Clinical Capabilities	Human	Echocardiographic Assessment of Cardiovascular Adaptation and Countermeasures in Microgravity								2001	2002
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Effect of Head Movement on Sympathetic Nerve Activity in Humans; The Effect of Head Movements on Sympathetic Nerve Activity in Humans: Role of the Vestibular System				1998	1999	2000	2001		
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Effect of Simulated Microgravity on the Vestibulospinal Reflex									2002
Cardiovascular Alterations	Human	Effects of Acute Intense Exercise and Microgravity on Mechanisms Associated with Blood Pressure Regulation in Humans	1995	1996	1997	1998	1999				

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Cardiovascular Alterations	Human	Evaluation of the Hemodynamic Mechanism Underlying Cardiovascular Adaptation in a Chronically Instrumented Rhesus Model During Simulated Microgravity	1995	1996	1997	1998						
Cardiovascular Alterations	Human	Exercise Training on Short- and Long- Arm Centrifuges				1998	1999	2000				
Cardiovascular Alterations; Bone Loss; Muscle Alterations & Atrophy	Human	Exercise Within LBNP to Produce Artificial Gravity	1995	1996	1997	1998	1999	2000				
Cardiovascular Alterations; Clinical Capabilities	Human	Facilitated Blood Pressure Control by Skin Cooling: Autonomic Mechanisms	1995	1996	1997	1998	1999	2000				
Cardiovascular Alterations; Muscle Alterations & Atrophy	Human	Growth Regulation in the Adult Cardiac Muscle Cell		1996	1997	1998						
Cardiovascular Alterations; Clinical Capabilities; Neurovestibular Adaptation	Human	Heart Rate Dynamics During Microgravity Exposure: Data Analysis	1995	1996	1997	1998	1999					
Cardiovascular Alterations; Human Behavior & Performance	Human	Influence of Gender and Age on Renal and Cardio-Endocrine Responses to Simulated Microgravity								2001	2002	
Cardiovascular Alterations; Clinical Capabilities	Human	Instrumentation for Non-Invasive Assessment of Cardiovascular Regulation				1998	1999	2000				
Cardiovascular Alterations	Human	Intercompartmental Fluid Shifts in Response to Postural and Gravitational Forces	1995	1996	1997	1998						
Cardiovascular Alterations	Human	Investigations of Mechanisms Associated with Blood Volume and Pressure Regulation							2000	2001		
Cardiovascular Alterations	Human	Load-Induced Cardiac Hypertrophy	1995									
Cardiovascular Alterations	Human	Mechanics of Cardiovascular De-Conditioning								2001	2002	
Cardiovascular Alterations; Clinical Capabilities	Human	Mechanisms of Antiarrhythmic Drug Action	1995	1996	1997	1998						
Cardiovascular Alterations	Human	Microcirculatory Adjustments to Simulated Microgravity Exposure in Humans				1998	1999	2000	2001			
Cardiovascular Alterations	Human	Modeling of Cardiovascular Response to Weightlessness	1995	1996	1997	1998	1999					
Cardiovascular Alterations	Human	NASA Center for Quantitative Cardiovascular Physiology, Modeling and Data Analysis	1995	1996	1997	1998	1999					
Cardiovascular Alterations	Human	Neural Regulation of Microcirculation in Humans				1998	1999					
Cardiovascular Alterations	Human	Neurovascular Response to Bedrest				1998	1999	2000				
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Neurovestibular Aspects of Artificial Gravity Created by Short-radius Centrifugation								2001	2002	
Cardiovascular Alterations; Clinical Capabilities	Human	Non-Invasive Assessment of Susceptibility to Ventricular Arrhythmias During Simulated Microgravity				1998	1999	2000				
Cardiovascular Alterations	Human	Noninvasive Intracranial Diameter and Pressure Measurement Using Ultrasound			1997	1998	1999					
Cardiovascular Alterations; Clinical Capabilities	Human	Noninvasive Measurement of Blood and Tissue Chemistry								2001	2002	
Cardiovascular Alterations; Bone Loss;	Human	NSCORT: Integrated Physiology	1995	1996	1997	1998						
Cardiovascular Alterations	Human	Orthostatic Intolerance - Short Flights (Dr. John B. Charles, Ph.D.)	1995	1996								
Cardiovascular Alterations	Human	Physiological Transport Responses to High Intensity Exercise and Hydrostatic Pressure Gradients in Humans	1995	1996	1997	1998						
Cardiovascular Alterations	Human	Pulmonary Deposition of Aerosols in Microgravity	1995	1996	1997	1998	1999					
Cardiovascular Alterations; Human Behavior & Performance	Human	Renal and Cardio-Endocrine Responses in Humans to Simulated Microgravity				1998	1999	2000				
Cardiovascular Alterations	Human	Renal Function Following Intense Supine Exercise								2001		
Cardiovascular Alterations; Human Behavior & Performance	Human	Renal-Endocrine Response to Gravity and Sleep Disruption	1995	1996								
Cardiovascular Alterations	Human	Renin-Angiotensin System								2000		
Cardiovascular Alterations	Human	Sarcoglycans and Vascular Smooth Muscle Cell Mechanics; Sarcoglycans and Vascular Smooth Muscle Cell Mechanics and Mechanotransduction								2000	2001	2002
Cardiovascular Alterations; Human Behavior & Performance; Neurovestibular Adaptation	Human	Sleep Restriction and Mechanisms of Orthostatic Tolerance			1997	1998	1999	2000				
Cardiovascular Alterations; Clinical Capabilities	Human	The Effects of Exercise-Enhanced Denitrogenation on Altitude Decompression Sickness (DCS) Protection	1995	1996	1997	1998	1999					
Cardiovascular Alterations	Human	The Effects of Gender on Sympathetic Response to Hypoxic Exercise								2000		
Cardiovascular Alterations	Human	The Role of Cardiac Mechanics in Blood Pressure Regulation During Orthostatic Stress: The Effect of Duration of Exposure to Simulated Microgravity				1997	1998	1999				
Cardiovascular Alterations	Human	The Role of Cardiac Mechanics in Orthostatic Intolerance					1998					
Cardiovascular Alterations	Human	The Sympathetic Nervous System in the Anemia of Weightlessness	1995	1996	1997	1998						
Cardiovascular Alterations	Human	Validation of Spectral Analysis as a Noninvasive Tool to Assess Autonomic Efferent Regulation of Cardiovascular Function	1995	1996								
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Vestibular Contributions to Post-Spaceflight Orthostatic Intolerance: A Parabolic Flight Model	1995	1996	1997	1998	1999					
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Vestibular Influences on Autonomic Cardiovascular Control			1997	1998	1999					
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Vestibular Modulation of Autonomic Responses to Orthostasis								2000	2001	2002
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Vestibular-Autonomic Interactions During and After Prolonged Gravitational Changes			1997	1998	1999	2000				
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Visual and Vestibular Autonomic Influence on Short-Term Cardiovascular Regulatory Mechanisms				1998	1999					
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Visual Vestibular Interaction	1995	1996	1997							
Cardiovascular Alterations; Neurovestibular Adaptation	Human	Visual-and Vestibular-Autonomic Influence on Short-term Cardiovascular Regulatory Mechanisms								2000		
Cardiovascular Alterations; Clinical Capabilities	Human	Physiological Effects of Decompression-Induced Venous Bubbles	1995	1996	1997	1998	1999					
Cardiovascular Alterations	Other	Applications of Mathematical Models in the Study of Countermeasures to Cardiovascular Deconditioning	1995									
Cardiovascular Alterations	Other	Cardiovascular Response to Gravitational Acceleration Using a Multi-Element Hydraulic Mock Circulation System			1997	1998						
Cardiovascular Alterations	Other	Computational Models of the Cardiovascular System and Its Response to Microgravity				1998	1999	2000	2001	2002		
Cardiovascular Alterations; Clinical Capabilities	Other	Hyperpolarized 129Xe MRI of the Brain, Lungs and Plants				1998	1999	2000	2001	2002		
Cardiovascular Alterations	Other	Integrated Modeling of Cardiac Mechanical and Electrical Function								2001	2002	
Cardiovascular Alterations; Muscle Alterations & Atrophy	Other	Integrative Cardiac Myocyte Model: Ion Channels, Ca and Contraction								2001	2002	